

Equine cardiac electrophysiology: Geeky toy or finally making the difference.

Special Interest Group on Equine Cardiology, The American College of Veterinary Internal Medicine (ACVIM) forum, 5-9 June 2019, Phoenix, Arizona, US.

Electrophysiology is complex and clinicians are often discouraged by its difficult clinical applicability. Gunther van Loon (ECEIM) will present where equine electrophysiology is and exciting news about how 3D electro-anatomical mapping and ablation are making a difference in horses. Kathy Wright (ACVIM-cardio) will present the comparative perspective of an electrophysiologist with wide clinical experience in many species to spark a discussion about how the equine veterinary community should move this field forward.



www.EquineCardioTeam.UGent.be

## Electrophysiology: geeky toy or finally making a difference?

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## Acknowledgements

### Equine Cardiology Ghent University ([www.equinecardioteam.ugent.be](http://www.equinecardioteam.ugent.be))

Dominique De Clercq  
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 Lisse Vera  
 Glenn Van Steenkiste  
 Ellen Paulussen  
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### Surgery department

Stijn Schauvliege  
 Thomas van Bergen  
 Ann Martens



### Cardiologists Human Hospitals

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 Daniel Dewolf



### Engineers

Eli Clement  
 Matthew Philpott  
 Stephan Zwart  
 Wim Van de Pitte



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## Disclosures

- Rhythmia system provided by Fulgur medical
- Lisse Vera & Glenn Van Steenkiste: predoctoral fellows from FWO (research fund Flanders)
- Vivid E95 supported by Special Research Fund Ghent University



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## CONTENT

### AIM 1

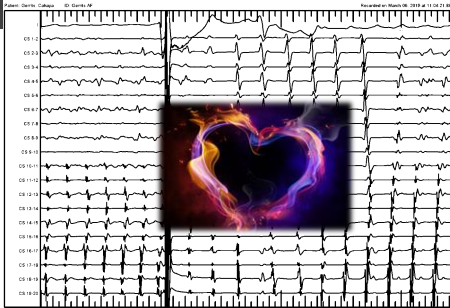
- Sensing, pacing: Temporary & Permanent
- Electrophysiological measurements & techniques
  - MAP
  - Arrhythmia induction
  - AERP, VERP (cSNRT)
  - AFCL, ATCL
- Arrhythmia Dx:
  - Multiple catheter mapping, pacing
  - 3D electro-anatomical mapping
- Arrhythmia Tx
  - (TVEC)
  - Overdrive pacing
  - Ablation



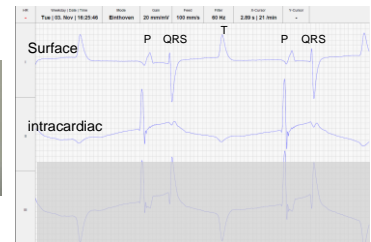
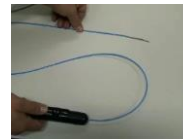
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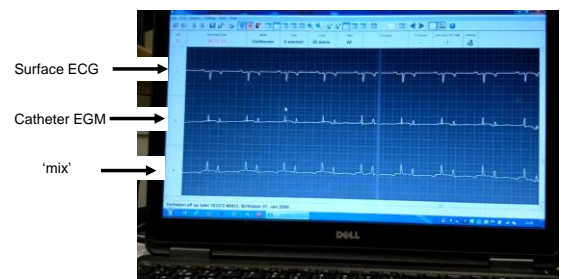
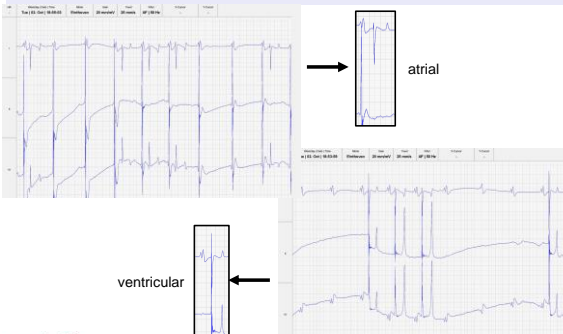
## AIM 2



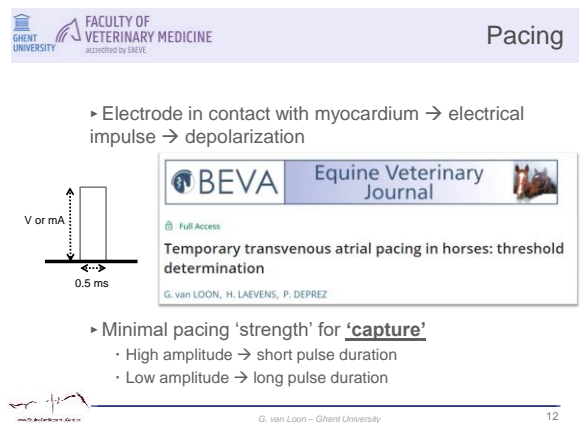
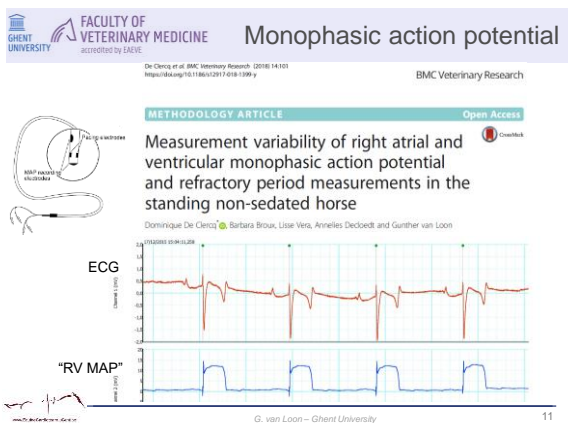
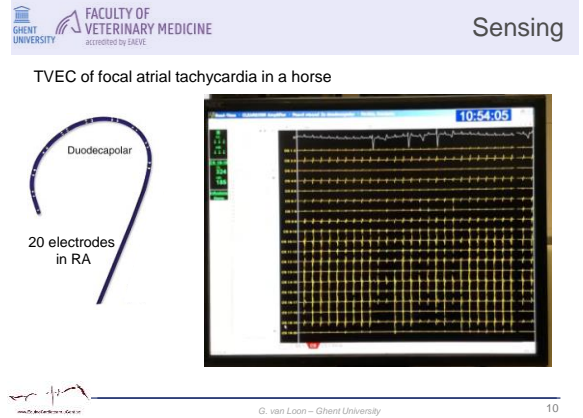
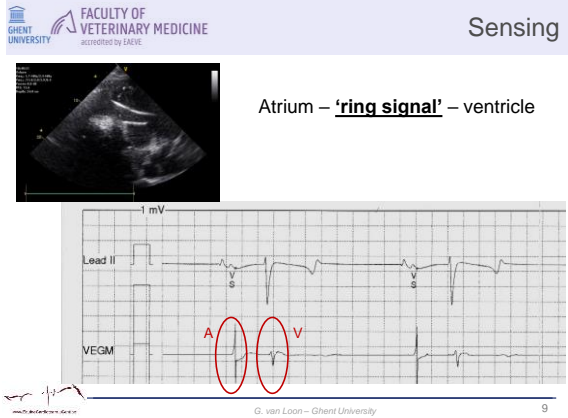
► Wire in the heart → register electrical activity



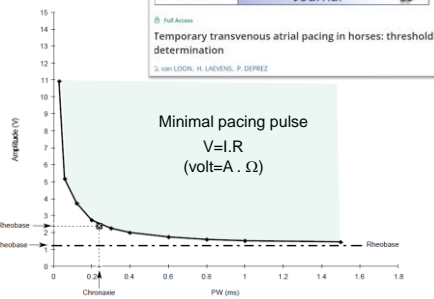
Sensing (mV) → sensitivity (threshold for sensing)



Pull back from RV towards RA in a standing horse



### Strength-duration curve



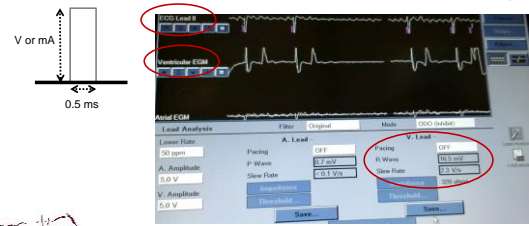
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## Pacing

- ▶ Electrode in contact with myocardium → electrical impulse → depolarization

VS= ventricular sensing  
VP= ventricular pacing

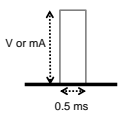


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## Pacing

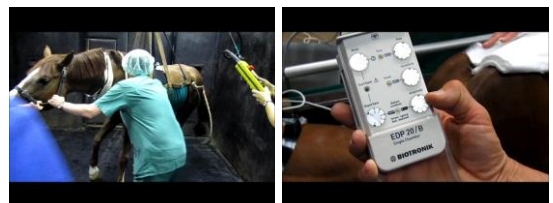
- ▶ Electrode in contact with myocardium → electrical impulse → depolarization



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## Pacing



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### ► Pacemaker implantation

*Journal of Veterinary Internal Medicine* **ACVIM**

Dual-Chamber Pacemaker Implantation via the Cephalic Vein in Healthy Equids 2001

G. van Loon, W. Fonteyne, H. Rotiers, R. Tavernier, L. Jordaens, L. D'Hont, R. Colpaert, T. de Clercq, P. Degrez

Active fixation  
Bipolar (sensing & pacing)



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### Pacemaker with "Home monitoring"

- pacemaker with adaptive control and WiFi
- Performs measurements of impedance, sensing and pacing threshold
- Automatic adaptation of output
- WiFi receiver in stable → Daily exchange of data
- Internet transfer of data
- Text message whenever check is needed

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Vari: healthservices@donk.nl

Verzendadres: donk@donk.nl

Aan: G. van Loon

Onderwerp: Home monitoring

Bestand: Home monitoring

Statu: 15/01/2018

Statu: 15/01/2018

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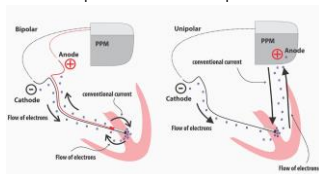
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### Pacing & sensing Bipolar versus unipolar



Phrenic nerve stimulation  
during RA pacing



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Boost & power your practice & daily life → cardiology!



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## 3D electroanatomical mapping

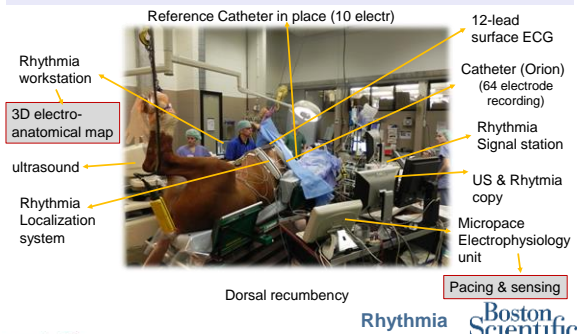
- Intracardiac electro-anatomical mapping
  - Reference catheter (usually coronary sinus)
  - Multiple electrode 'mapping catheter'
  - Position of the electrode is 'tracked' in the heart
    - Registration of all electrical activity (electrograms)
    - Build a 3D 'shell' of the inside of the heart
- Result
  - 3D heart
  - All electrical signals
  - Voltage map
  - Activation map



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## 3D electroanatomical mapping



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## Mapping & ablation



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## Mapping & ablation



Sinus rhythm since 4 months  
Returning back into sport



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## Conclusion

- Feasible & applicable: many techniques in standing horse
- Research
  - AAD
  - Arrhythmias: induction, therapy, consequences,...
  - Development of new techniques
- Clinical patients
  - Improved diagnosis
  - Targeted therapy



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